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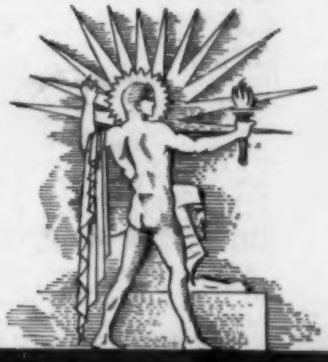
SCIENCE NEWS LETTER

THE WEEKLY SUMMARY OF CURRENT SCIENCE •



APRIL 28, 1934

'Gator's Great-Gran'pappy

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SCIENCE NEWS LETTER

VOL. XXV *No. 681*

The Weekly Summary of Current Science

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DO YOU KNOW?

There are 450 horticultural associations listed in the United States.

The ill-famed skunk is a valuable ally of the farmer in running down and devouring Japanese beetle grubs.

By use of infrared rays, a research worker is reading the censored portions of Spanish inquisition records, which were long ago blotted out.

An archaeologist who studied 2,000 inscriptions concludes that among the ancient Greeks average expectancy of life was only about 29 years.

The Dutch elm disease, which is now attacking elm trees in New York and New Jersey, is reported to be still unchecked in its spread in Europe.

Papyrus, the Egyptian writing "paper," was probably introduced into Greece and Rome after Alexander the Great made his victorious Egyptian expeditions.

The vision of children as young as two years can be tested scientifically.

The shortage of rain that has been felt in North America in recent years has had for one result a large number of dust storms.

Illinois has passed a law requiring the use of prophylactic drops in the eyes of all newborn babies, to safeguard them against babies' sore eyes.

An archaeologist recently cut down a four-inch maple tree in six minutes, using a 9,000-year old flint axe made by a prehistoric Scandinavian.

Ultraviolet rays enable the art connoisseur to distinguish ancient marble from marble fresh cut and from ancient marble reshaped at a later date.

Indians of tropical America made purple dye from a marine snail belonging to the same genus that yielded the famous Tyrian purple of the Old World.

WITH THE SCIENCES THIS WEEK

ARCHAEOLOGY

How did the wives of Rim-Sin rival each other? p. 269. *Early History of Assyria, to 1000 B.C.—Sidney Smith—Dutton*, 1929, $12.

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Where do the greatest problems of evolution center? p. 267.

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What are the four ways in which heredity can affect the development of disease? p. 266. *Organic Evolution—Richard Swann Lull—Macmillan, Rev. ed.*, 1929, $4.50.

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What is speed for a snail? p. 264.

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How is an electron "seen" by the physicist? p. 262.

Is air necessary for the propagation of an explosion wave? p. 264.

What does an atom look like? p. 259. *Introduction to Modern Physics—F. K. Richtmyer—McGraw-Hill, 2nd ed.*, 1934, $5.

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PHYSIOLOGY

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How does a fish change its color? p. 263.

How does benzol vapor kill? p. 267.

In what way is the circulation of blood like the atmosphere? p. 260.

PSYCHOLOGY

Are ten tones ten times as loud as any one singly? p. 270.

These curiosity-arousing questions show at a glance the wide field of scientific activity from which this week's news comes. Book references in italic type are not sources of information for the article, but the references for further reading. Books cited can be supplied at Book Department, Science News Letter, at publishers' prices, prepaid in the United States.

EVOLUTION

Biologists Urged To Drop Senescent Evolution Theories

Osborn, Condemning Old Doctrines Dating Back to Ancient Greek Times, Calls For a "Wholly Fresh Start"

EVOLUTIONARY doctrines, no less than evolving species of animals or plants, grow old and become due for the discard. Several such theories were hauled up for criticism before the meeting of the National Academy of Sciences by Dr. Henry Fairfield Osborn, veteran paleontologist and former president of the American Museum of Natural History.

The "chance" theory of evolution, dating back far into ancient Greek times and still upheld by such notable biologists as Dr. Thomas Hunt Morgan, American Nobel prizeman, and J. B. S. Haldane of England, was singled out for first condemnation. "There is a general failure," said Dr. Osborn, "to distinguish between Darwin's positive demonstration of the selection of the fittest combinations of energy which we observe in organisms, and the origin of a single organ or of a single species through the selection of variations which in any sense of the word could be designated as 'chance.'"

"Moribund"

The Lamarckian creed, which holds that new characters are directly impressed on the organism by forces in the environment and that such acquired characters are inherited, Dr. Osborn characterized as being "now in a moribund condition." Another "which does not bear the crucial test of observations," has been built around a misunderstanding of Aristotle's inductions of an internal principle governing evolution, expressing itself in modern times in such ideas as Driesch's "entelechy" and Bergson's "*élan vital.*"

"Much less senescent and in a much more healthy condition at present," continued the speaker, "is the doctrine of the direct action of environment not only upon the organism but upon the geneplasm. It seems fair to connect this creed of direct environmental action to the names of Buffon and Geoffroy St. Hilaire because these distinguished Frenchmen of the 18th and beginning of the 19th centuries were the first to formulate the theory of environmental action and to adopt it. It now seems to be well established that one of the direct causes of the origin of species is the gradual and inherited modification of the geneplasm by the forces of the environment."

Dr. Osborn concluded with an appeal to biologists quietly to "drop all these senescent hypotheses as to the nature and causes of evolution and make a wholly fresh start along entirely new and original lines of observation and experiment, directed toward the discovery of the now wholly unknown factors in this most mysterious of natural phenomena."

Science News Letter, April 28, 1934

PHYSICS

Photograph Shows Atom As if Seen By X-Ray Eye

PHOTOGRAPHS OF ATOMS, in effect magnified 200,000,000 times, were thrown on the projection screen of the National Academy of Sciences meeting to show what the atoms might look like if we had "X-ray eyes" and could look at atoms through a powerful X-ray microscope.

Dr. Arthur H. Compton and Dr. E. O. Wollan of the University of Chicago declared that their photographs "afford probably the most direct information now available regarding the way in which electrons are distributed in atoms."

The photographs are images of atoms of helium, neon and argon as obtained by X-ray diffraction. The actual photographs were obtained by photographing a rotating template whose shape is calculated by a mathematical transformation of the scientists' measured values and of the X-rays scattered by helium, neon and argon gases. This mathematical-mechanical procedure corresponds to the lens which forms the image when a microscope is used.

The photographs show the helium atoms as a diffusely continuous region filled with electricity. In neon, the inner group of electrons, called the K level, is clearly distinguishable from the outer L electron group. The resolving power is insufficient to distinguish between the K and L groups of electrons in argon, but it does separate these from the M electrons. The appearance of these atoms as shown by the photographs is in good accord, Drs. Compton and Wollan reported, with modern quantum theory of atomic structure.

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THE INVISIBLE

This photograph, made through a combination of mathematical and mechanical technique, shows what the atom might look like if you could see it. The arrows mark the distance of one Angstrom, or .00000001 cm.

MEDICINE

Study of 91-Year-Old Man Shows Way to Serene Age

LEARN not to worry if you want to have a long, healthy life.

Scientific study of a man 91 years of age with extraordinary physical and mental preservation shows that this is the chief rule to be followed in attaining healthy old age. The study was made by Drs. Francis G. Benedict and Howard F. Root of the Carnegie Institution of Washington's Nutrition Laboratory and the New England Deaconess Hospital, Boston, and reported to the National Academy of Sciences.

The other factors contributing to this man's condition are: conspicuous absence of hardening of the arteries in the man's family; and exemplary habits.

Science News Letter, April 28, 1934

MEDICINE

Headache Remedy Believed Cause of New Fatal Disease

Pyramidon and Related Medicines Poison Bone Marrow, Causing Drop in Number of White Blood Cells

THE CAUSE of a new, fatal disease has probably been found in amidopyrine, better known as pyramidon, widely used remedy for headaches and for relieving pain in such other conditions as sciatica and arthritis.

Pyramidon and a group of chemically related medicines also used to relieve pain seem to poison the bone marrow where some of the blood cells are formed, causing agranulopenia.

This disease has a number of aliases by which it is known to medical scientists: agranulocytic angina, agranulocytosis, malignant leukopenia, granulocytopenia, and malignant neuropenia. It starts suddenly with fever and sore throat. Some of the patients thought they were getting a cold. Ulcers appear on tonsils, tongue, gums and elsewhere, spreading rapidly. Most striking, however, is the drop in the number of white blood cells from a normal of 6,000 or 7,000 per cubic millimeter of blood to 2,000 or less. The number of red blood cells and the amount of hemoglobin, meanwhile, remain normal. Most of the patients die in spite of treatment.

Discovered By Germans

The disease was first observed by a group of German scientists in 1922. But the connection between the medicine and the disease has only just been observed.

No cause for agranulopenia had been found up to last year. Then Drs. F. W. Madison and T. L. Squier of Milwaukee, mulling over the situation, realized that the increase in number of cases of agranulopenia paralleled the increase in use of pyramidon with other drugs containing a barbiturate, such as luminal. They studied the records of thirteen consecutive cases and found that all the patients had been taking one or more of these drugs over varying periods of time before the onset of the disease.

They tried giving doses of the medicine to rabbits, and one animal developed the characteristic drop in white blood cells, while three others showed characteristic changes in bone marrow.

Previously, in 1931, Dr. R. R. Kracke of Emory University, had pointed out a possible connection between the use of coal tar derivatives and attacks of agranulocytosis. He reported in the next year that 8 out of 9 patients having this disease had been taking drugs containing the chemical group known as the benzene ring.

Both pyramidon and the barbiturates contain this chemical group. Benzene itself has been responsible for poisoning cases in industry. Some persons seem more susceptible to it than others, and investigators of agranulopenia, suggest that in this disease also individual susceptibility or idiosyncrasy may play a part.

Over 50 cases of agranulopenia, developing in patients who had previously taken pyramidon with or without one of the barbiturates, modern sleeping and pain-relieving powders of the veronal and luminal group, have been reported by Drs. C. H. Watkins and P. S. Hench of Rochester, Minn., Samuel B. Grant of St. Louis, Johnson McGuire of Cincinnati, Clyde L. Randall of Kansas City, Mo., and Arthur M. Hoffman, E. M. Butt and N. G. Hickey of Los Angeles.

The use of pyramidon either alone or in combination with other drugs, should be restricted to patients having white blood cell counts made several times a week, warn the Los Angeles investigators, Drs. Hoffman, Butt and Hickey, in their report to the *Journal of the American Medical Association*.

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PHYSIOLOGY

Muscle Tone Drives Blood In Veins Back To Heart

THE TONE of your muscles is what drives the blood in your veins back to your heart. The poor circulation that may follow an attack of influenza or a surgical operation is due to the fact that the disease or the shock of the operation has lessened the muscle tone.

This new explanation for what has long remained a scientific mystery was offered by Drs. Yandell Henderson, A. W. Oughterson, L. A. Greenberg and C. P. Searle of Yale University at the meeting of the National Academy of Sciences.

The circulation of blood through the body is under the control of the heart and the vasomotor system which presides over the contraction and expansion of the walls of the blood vessels. Dr. Henderson has long believed that in addition to these two mechanisms there must be a third factor responsible for sending the blood back into the heart. Today he announced that he and his associates believe they have found this factor to be muscle tone. Their theory reverses the idea that poor muscle tone was due to poor circulation.

Muscle tone itself is controlled from the central nervous system and considerably influenced by the breathing center, Prof. Henderson said.

The left side of the heart provides the force that drives the blood into the blood vessels in the muscles, he explained. If the muscles have tone a part of this force is taken up by their elasticity and presses the blood on into the veins and on through them into the veins leading to the right side of the heart. But in the absence of muscle tone, the entire force of pressure in the arteries carrying blood from the heart is lost in the flaccid tissues and the blood stagnates there instead of flowing on back to the right side of the heart.

Heart is Body's Sun

"These mechanical relations are best understood by comparing them to the circulation of water in the atmosphere," he continued.

"The sun by its heat lifts water from the sea into the clouds. It supplies the energy, as the heart does in pumping blood from the low pressure in the veins up to the high pressure in the arteries. Meteorological conditions deter-

mine where rain shall fall, much as the vasomotor system controls the distribution of the arterial blood to the various organs. If the rain falls on mountains or a high plateau the water runs back to the sea with a force that can be used to turn mill wheels or produce hydro-electric power. Such streams from high levels are analogous to the venous blood streams from muscles in good tone.

Sluggish Streams

"If on the contrary the rain falls on a swamp at sea level or other low ground the stream back to the sea is sluggish. Similarly when the tone of all the muscles in the body is low the venous stream to the heart is sluggish. And because of the diminished venous supply to the heart the volume pumped by the heart into the arteries is diminished and the entire circulation is depressed.

"It is not merely by positive pressure that muscle tone promotes the flow of blood to the right heart. The negative pressure in the chest, which draws the venous stream toward the heart, likewise varies with the tone of the thoracic muscles. After surgical operations and anesthesia involving even a slight degree of depression of vitality, or shock, the tone of the diaphragm is decreased, and because of the relaxation of this muscle the so-called vital capacity of the lungs is diminished. In cases of considerable depression a partial atelectasis, or even a massive collapse of the lung, may develop. This relaxation of the diaphragm, established by X-ray observations, first suggested to us the relation of muscle tone to the circulation."

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PHOTOGRAPHY—MEDICINE

Infrared Photographs Aid in Diagnosis

PHOTOGRAPHS taken through the skin by means of the invisible infrared rays of the spectrum are now helping physicians to detect varicose veins and obstructed veins. They are expected to prove even more valuable in determining the success of treatment in these conditions.

Examples of this type of photography were displayed by the Eastman Kodak Company at the meeting of the Western New York Society of Radiographers.

Pictures taken with photographic plates not sensitive to infrared rays show the skin approximately as the eye sees it. But when infrared-sensitive plates are used, a very distinct pattern of the veins under the skin appears in the finished picture. On this type of photograph physicians can see varicose veins or obstructed veins, when they are present, and can watch directly the effect of treatment by taking more of these infared photographs during the course of treatment.

LOOKING BELOW THE SKIN

Infrared light photography, which has formerly served the navigator by piercing fog, now aids the physician in diagnosing ailments of the veins and other blood vessels below the surface of the human skin. The skin is somewhat transparent to infrared rays, but the flesh beneath reflects them in greater intensity where there are no blood vessels than where these are present. No diseased condition is present in the arm shown.

The results with infrared-sensitive photographic plates are due to the fact that the skin is somewhat transparent to these rays. As they penetrate the skin and the tissues just beneath it, they become scattered and are reflected back to be picked up by the lens of the camera. Where there are blood vessels just below the skin, near the surface, the intensity of the rays reflected back is less than in the parts where there are no blood vessels. The superficial veins, therefore, show up in contrast to the rest of the flesh, looking on the finished picture as if they had been traced with a heavy pencil.

The infrared-sensitive photographic plates now being used in medical diagnosis have previously been used to take pictures in darkness, at great distances (331 miles), for important astronomical observations, and is used in the "fog navigation camera" aboard the Steamship Manhattan.

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PALEONTOLOGY

Fossils of Shark Found In Pennsylvania Rocks

SHARKS SWAM in fresh water near the site of Philadelphia, back in the days of the dinosaurs. That these usually salt-water fish should have lived in a habitat commonly thought of as alien to them is not really paradoxical, however, Dr. William L. Bryant, director of the Park Museum in Providence, R. I., told the American Philosophical Society. Sharks and their relatives ascend rivers far from the sea; and there is a fresh-water shark species still in existence in Lake Nicaragua.

These ancient Pennsylvania fresh-water sharks have been found in rocks that contain also the remains of an undoubted fresh-water fish of a higher order, and also fossils of land plants and dinosaur footprints. The formation belongs to the Triassic geologic period, of an antiquity estimated at approximately 180 million years.

At the same session, Prof. Glenn L. Jepsen of Princeton University told of a strange little fossil animal from the rocks of South Dakota, that lived in Oligocene times perhaps 50 million years ago, when the leading citizens of that region were the enormous rhinoceros-like Titanotheres. This small beast belongs to a mixed group of extinct mammals that have been classified sometimes with the lowest of the monkey-like animals, sometimes with the moles and shrews. As a result of its discovery it has been necessary to re-examine all the related fossils and rearrange their classification. This work involved extensive use of X-ray photography.

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PHYSICS

The Electron is Real

Minute Phenomena Such as Atoms, Although Unfamiliar, Are Just as Real as the Stars, Says Sir Arthur Eddington

THE PHYSICAL world does exist, Sir Arthur Eddington, the British scientist, assured University of Chicago scientists, "if by exist is meant to have a structural representation inferred from the scientific relations derived from sense perceptions."

But to the question: "Is it the only world that exists?" Sir Arthur replied: "Who knows?"

The search for truth is confused by a body of inaccurate knowledge, Sir Arthur explained. He compared the communication between the external world and the mind to a "story-teller's" free translation of a cipher. The senses receive a set of signals transmitted by nerves to the conscious mind, where an inaccurate decoding occurs.

The difficult task of physical science is to infer knowledge from the code messages received. Physical science does not concern itself with the mind and transcendental notions. It deals only with the cryptograms presented for solution, and endeavors to discover the recurring regularities, which are apparent to many different minds.

An important feature in the unraveling process is the redundancy of the senses. Physical science has striven for unification by reducing the number of the senses reporting messages, and selecting the sense perceptions which are mathematical in nature, such as the reading of a galvanometer. In the scientific world there are no colors, there are only numbers corresponding to different colors, as there are numbers in a telephone directory corresponding to different individuals.

One Color-blind Eye

Up to the time of the appearance of Einstein's relativity theory, the ideal scientific observer had been a creature whose only sense organ was one color-blind eye, able to look only in one direction, distinguish between white and black, and recognize spatial form and size. Einstein further mutilated this creature by removing the ability to recognize spatial form and size, and leaving it only a small patch of retina able to observe when a pointer coincides with a scale reading.

Such an idealized observer would make a competent astronomer, Sir Arthur contended. In his observatory a telescope focusses star light on a photo-electric cell which actuates an electrometer needle, changing its coincidence with one scale reading to coincidence with another scale reading, while the hand of a stop-watch behaves similarly. So the intensity of the light of a star would be inferred. So the glory of the heavens has been reduced to pointer readings, and the familiar "story teller" has been expelled as a false god.

From these pointer readings can we infer anything but relations between pointer readings? Yes, Sir Arthur answers, the intellect demands a structure which is independent of these relations. According to Einstein's terminology the pointer readings give us world-line intersections. We may use any structural representation which leaves the world-line intersections invariant. There is, indeed, a fluidity of representation for saying what we observe in terms of the data from the physical world.

No Longer Simple

This is the epoch-making discovery of Einstein's relativity theory, which revolutionized scientific thought. In its ordinary course of progress science found this multiplicity of representation, so that time and space are no longer the simple, axiomatic pictures presented by the "story-teller."

The philosopher might have arrived at this conclusion centuries before. To him the physicist is a slow, thick-headed workman muddling along. To the physicist, on the other hand, the philosopher is an officious spectator, offering tools before ability to use them has been achieved.

The theory of relativity deals with macroscopic phenomena such as are familiar to the "story-teller." The quantum theory is concerned with less familiar phenomena of minute substances such as the atom and the electron. The point of view that there is a difference between these two sets of phenomena, such as for example, between a star and an electron, or that an atom is "unverifiable" is unwarranted in Sir Arthur's opinion.

"If I have seen a star, I have seen an electron," he said. There is no difference in the reality of a star seen as a bright spot surrounded by a diffraction pattern and of an electron observed as a track in a Wilson cloud-chamber.

If the physical world is an hypothesis, the star and the electron are hypotheses; if the physical world exists the star and the electron exist.

Indeterminism Reconciles

The rise of indeterminism in modern physics is healing the broad breach between experimental physics and philosophy, Sir Arthur Eddington told a scientific audience at Cornell University.

Indeterminism is making possible the reconciliation of the physicist's idea of the universe with that of the layman gleaned from purely human reactions to environment.

Science has abandoned the theory of determinism, based on the laws of cause and effect, and has thus destroyed the strongest defense of philosophical determinism which bases its denial of free will upon the absoluteness of physical law. The freedom of mind and will is wholly fictitious if the body must obey physical laws which state that all physical action is an unbreakable chain of cause and effect following inevitably one from the other, but now that this chain is no longer unbreakable, such freedom may no longer be fictitious.

The amount of indeterminism at present admitted in physics is not yet sufficient to justify a scientific theory of free will, Sir Arthur said. Science can still locate an electron within an inch and a half after it has been travelling 10,000 miles, which distance it has covered in a second, while for larger aggregates of matter the accuracy is so great as to be almost certainty. In fact, classical laws, based on causality, are so nearly scientifically accurate that they are not considered invalid but as stating the truth in the special case, where the number of units considered is almost infinitely large. Science does not disprove classic laws, but is no longer based on them but on statistical laws.

Showing the difference between the two laws, Sir Arthur gave two illustra-

Science and Philosophy

Philosophy and our notions of the world around us are being modified by the recent revolutionary progress of the new physics. The latest impacts of science upon modern thought are explained by Sir Arthur Eddington, just arrived in the United States to visit American Universities. *(See also SNL, April 21, 1934.)*

tions. Basing the statement on the rate of occurrence observed in the past, we may predict that in the next thousand years there will be approximately a certain number of eclipses of the sun. This will not state the exact time of these eclipses but only the number. Here we have an example of statistical method. Or we can state the exact time of the next eclipse, basing the statement on astronomical laws of cause and effect, or classical law. Modern science does not invalidate this second calculation but merely considers its accuracy is the result of the large number of units with which it deals, making the probability of error so slight as to be negligible.

In the second illustration, applying the same reasoning to radioactive atoms, where the number of units involved is extremely small, statistical law holds, but classical law does not, for the number of explosions of such an atom in a given time can be determined but the exact time of any one explosion can not.

Atoms Have Free Will

Science at present holds that the impossibility of predicting events of this kind is due not to any inadequacy of method of measurement but to an inherent quality of the atom itself, i. e., that atoms have free will. But to jump to the conclusion that free will is therefore possible for the individual is prevented by the fact that indeterminancy is present only when extremely small units are observed, so small that it is unlikely that the action of such small units could be responsible for initiating human action.

This change in scientific attitude and method is significant, however, since it admits the scientific possibility of free will, whereas classical theory absolutely prohibits such a possibility.

New Maxim

"Never believe an experiment until it is checked by theory."

Sir Arthur Eddington would add this maxim to rules for science's guidance.

Theory and experiment must evolve together, he told University of Chicago scientists when he discussed the latest theories of the expanding universe.

Sir Arthur told the story of the expanding universe, which fills scientists with wonder and doubt. He went far in dispelling the doubts but at the same time retained the characteristic awe. Doubts arise over the statement that the galaxies are receding with velocities proportional to their distances from us.

Velocities are determined from the Doppler effect, in this case the shifting of the spectrum lines to the red—the more distant galaxies having the greater shift. Distances are obtained from the period in the luminosity of Cepheid variables by a relationship between this period and their distance. This relationship has been checked for nearer Cepheid variables.

De Sitter's Theory

In 1917 Prof. Willem De Sitter, the Dutch scientist, brought forward a theory of the expanding universe which required this relationship between distance and velocity, but at that time the supporting evidence was meager; however since then a great deal of additional evidence has been accumulated. For galaxies 1,500,000,000 light years distant their velocities of recession are of the order of 15,000 miles per second.

What happens then with galaxies that might be so far distant that their velocity of recession should be greater than the velocity of light? Profs. Albert Einstein and Hermann Weyl surmounted this difficulty, which would contradict the fundamental basis of relativity, by assuming a closed curved space. This spherical space is such that it would take light approximately 6,000,000,000 years to come back to its starting point. If we intend to make this trip we should commence immediately as the space itself is expanding!

This mathematical curved space must be equivalent to a force of repulsion which force is causing the expansion. According to Newton, gravitational forces of attraction are exerted between objects, and these forces also must be taken into account but their magnitudes are negligible except when the distances between the objects are relatively small.

In the beginning of things, Sir Arthur believes that matter was so distributed that these forces of Newtonian attraction and cosmical repulsion balanced one another, the equilibrium however being unstable. In our own solar system where distances are relatively small the Newtonian attraction has the upper hand, whereas for the galaxies the cosmical repulsion predominates and such types of equilibrium are stable. Why one or the other took precedence it is impossible to say at present.

From astronomical data the total amount of matter in the universe is 10^{22} times the mass of the sun, or 10^{79} protons and electrons. The universe thus consists of 10,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000 particles. This figure should be fairly secure because of the difficulty of checking it, but Sir Arthur thinks that it can be checked from the wave mechanics of an electron.

The wave equation for an electron gives a relation between the size of an electron and the universe, is it not somehow possible to reverse this equation and get a relation which will tell the behavior of the universe in terms of an electron? This relation should somewhere hide the number 10^{79}, and then would form one of the main pillars of science.

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PHYSIOLOGY

Nerves Act Gland-Fashion In Causing Color Changes

WHEN A FISH changes its color, as some fishes do, becoming darker or lighter according to background, the color change is impelled by a glandlike action of the nerve ends, secreting a substance called a "neurohumor." So Prof. G. H. Parker of Harvard University told the American Philosophical Society.

Prof. Parker has given much attention to this long-suspected but only recently demonstrated gland-like activity of nerve endings. In the case of the color-changes in fish, he found that there are two opposing neurohumors at work. One set of nerves secretes a neurohumor that causes the color bodies, or melanophores, to spread their pigment through their cell processes, and the neurohumor from a second set of nerves causes them to concentrate.

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Two trees of the big South African lemon, which yields a pint of juice, are now bearing fruit at the University of California's Citrus Experiment Station.

MEDICINE

Animals Do Not Carry Infantile Paralysis

ANIMALS other than man do not carry infantile paralysis. The disease is not acquired by swallowing the causative virus with food or drink.

Evidence showing these statements to be true were presented by Dr. Simon Flexner, director of the Rockefeller Institute for Medical Research, at the meeting of the National Academy of Sciences.

Previously Dr. Flexner has reported that the virus or germ of this disease enters the body via the nerves of smell. His latest studies seem to show conclusively that the virus cannot penetrate the lining of the stomach or digestive tract. Neither can it penetrate the unbroken skin. It can cause disease only by attacking nerve tissue, and its only way of reaching the central nervous system is by way of the exposed nerves of smell in the nose.

"The evidence is strong that the virus is confined to the human host, and passes from individual to individual in the secretions of the nose and throat," he stated.

Science News Letter, April 28, 1934

GEOLOGY

"Galloping Snails" Solve Riddle of Rock Markings

SNAILS of the east coast of Africa have helped Prof. Othenio Abel, Vienna University geologist, to solve the riddle of certain markings in fine-grained sandstones found near Vienna, that have stumped scientists for many years.

Some time ago, Prof. Abel had opportunity to watch the behavior of the strand animals on the wet beaches of the east coast of Africa. A certain species of snail attracted his special attention. This snail, scientifically known as *Bullia*, is a veritable galloper among snails; it can travel over the wet sand at the rate of nearly a yard a minute. It feeds mostly on stranded jelly-fish; hundreds of the snails can be seen hastening to the feast wherever one of these luckless creatures has been washed ashore.

If the sand becomes too dry, or if something frightens the snail, it behaves in a most peculiar manner. It wraps its wide "foot" around its shell, turns a somersault, and disappears into the sand. There, having found a level at which the moisture is more to its liking, and concealment from any threatening foe as well, it goes on its subterranean way, mole-fashion. Naturally, this subterran path leaves a burrow quite different from *Bullia's* surface track; and a comparison of the modern snail-burrows in the African beach sand and the puzzling markings in the ancient Austrian sandstone shows a convincing similarity.

Clinching the argument even more closely was Prof. Abel's observation that an abruptly ended surface track on a slab of the sandstone could be traced as a burrow-marking on the under-side of the same slab. The ancient *Bullia* had evidently seen something it did not like, dived, and "continued the march" underground, leaving its footprint in the gradually hardening sands of time.

Science News Letter, April 28, 1934

PHYSICS

World Cruise Shows Cosmic Rays Less in East

A NEW fact about cosmic rays was revealed when Dr. Victor Neher of the California Institute of Technology described the results obtained from instruments which recently returned from cruises around various parts of the world aggregating fifty-two thousand miles.

The instruments recorded automatically for a period of several months. As the vessels on which they shipped idled in some ports the instruments busily recorded more and more data until they achieved the highest accuracy so far obtained in work of this kind.

This accuracy permitted Dr. R. A. Millikan to say with certainty that in these voyages there appeared not only a latitude effect but a longitude effect as well. That is, not only did the cosmic rays show a decrease in intensity as one sails into the equatorial regions but they also showed a decrease to a lower value in the eastern hemisphere than in the western. This effect can probably be correlated with the magnetic field of the earth, which is strongest in the eastern hemisphere.

The new result is, however, so difficult to reconcile with existing interpretations that Drs. Millikan and Neher present it merely as the result of these voyages, leaving it to the future to determine whether it is repeatedly duplicable or not. The experiments were all a part of a program of Dr. Millikan which is supported by a fund of the Carnegie Foundation.

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IN SCIENC

PHYSICS

Explosions Observed Under Microscope

THE POSSIBILITIES of studying explosions under the microscope has been pointed out by two French scientists, Dr. A. Michel-Levy and Dr. H. Muraour.

The quantity of explosive used must be very minute, a milligram (.015 grain) or less, and the explosive should preferably be one that leaves a metallic deposit. Nitride of lead was found suitable. From the lead pattern left on the microscope slide, the nature of the explosion can be studied.

Using two specks of this substance a short distance apart and exploding one of them, the experimenters found that the second was exploded by the shock, and an interference pattern was formed. When the distance apart was large, the second speck was not exploded, but merely burned by the hot gases when they arrived, and no interference pattern was formed. When the experiment was tried in a vacuum, the second particle did not explode even when quite near to the first one. The shock wave is therefore propagated by the air and precedes the expanding hot gases.

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PHYSIOLOGY

Cut Nerve Remains Active For Week

NERVES cut off from their base of action do not necessarily give one last "kick" of activity and then quit, as the old theory has it. They can stay at a high level for a solid week, Prof. G. H. Parker of Harvard University reported before the meeting of the National Academy of Sciences.

It has been supposed all along that a severed nerve responds momentarily when stimulated, as by an electric shock, but that the response is never for more than a moment. Prof. Parker found, however, that when he cut a nerve that causes the color of a catfish's tail skin to darken, a dark band appears and persists for as much as seven days.

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NCE FIELDS

ASTRONOMY—PHYSICS

Electric Eye Aids In Viewing Distant Objects

SO SENSITIVE that it will detect without telescopic aid an ordinary candle flame thirty miles away, a photoelectric cell-vacuum tube amplifier combination is the latest useful tool of the astronomer described to the National Academy of Sciences by Dr. Joel Stebbins of the University of Wisconsin and Dr. Albert E. Whitford of the Mount Wilson Observatory, Calif.

Using the world's largest telescope, Mt. Wilson's 100-inch reflector, the amplifying "electric eye" could detect a candle at 3,000 miles. It can measure the faint luminosity of the sky beyond the range of the photographic plate, and it measures star colors more precisely than the human eye or photography.

The first success of the new instrument used at Mt. Wilson was the detection of interstellar dust of the Milky Way through the reddening effect of the dust upon starlight. Just by measuring the colors of the stars of the Milky Way, Drs. Stebbins and Whitford were able to tell that the earth is at one side of the center of the great stellar system that comprises our Milky Way galaxy. When allowance is made for the obscuring effect of the dust between the stars, our galaxy is found to be not so great or important as was thought, although it may still be the largest one in sight.

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CHEMISTRY

Deuterium Measures Efficiency of Catalysts

HEAVY hydrogen (deuterium), with atoms double the weight of those of ordinary hydrogen, has been studied by science for hardly more than a year, yet it has already found one use of both scientific and eventual economic importance. This was described before the meeting of the American Philosophical Society by Prof. Hugh S. Taylor of Princeton University.

The new double-weight twin of hydrogen is used to measure the efficiency of various kinds of surfaces on which chemical reactions involving hydrogen are hastened. These surfaces, collectively known as catalysts, are of great importance in industry as well as in the laboratory; modern chemical engineering and manufacturing could not exist without them.

The method of measuring the efficiency of hydrogenating surfaces used by Prof. Taylor is simple. He applies to such surfaces a mixture of hydrogen molecules, each consisting of two light-hydrogen atoms, and deuterium molecules, each consisting of two heavy-hydrogen atoms. The action of the surfaces brings about a regrouping of part of the gases, forming molecules consisting of one heavy-hydrogen atom and one light-hydrogen atom each. The efficiency of any given surface is measured by the rate at which this transformation takes place.

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MEDICINE

Tetany Cured By Drug Related to Vitamin D

TETANY, the severe nervous and muscular disease featured by painful muscular cramps and caused by an insufficiency of calcium in the blood, can now be cured or greatly relieved without delay, even in the worst cases. Tetany should be distinguished from tetanus, or lockjaw.

The new treatment, described by Dr. I. Snapper, professor of medicine and general pathology in the University of Amsterdam, in *The Lancet*, British medical journal, is the giving of a substance known to pharmacologists as "A.T. 10."

"A.T. 10" is a fraction of the well-known irradiated ergosterol which is rich in vitamin D. Prolonged dosage with ordinary irradiated ergosterol, in conjunction with oral doses or injections of calcium, has previously been used as a treatment for tetany. Though in some cases it was fairly successful, in others disagreeable and even dangerous symptoms were produced. From "A.T. 10," however, the vitamin D is absent, and there are no unwanted symptoms provided that the doses are stopped as soon as the blood's calcium content has been brought to normal. This is usually achieved within comparatively few days.

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ETHNOLOGY

No Talk To Mother-in-Law, Strange Tribe Decrees

A TRIBE that has solved the mother-in-law problem has been found.

Among the Yaruro Indians of Venezuela, a son-in-law is forbidden to talk to his mother-on-law, is the report brought by Vincent Petrullo, of the University of Pennsylvania Museum, who has just returned from studying these natives.

Although son-in-law and mother-in-law may not speak, or even look at one another, they must take care of each other, Mr. Petrullo said. If in camp together, they sit facing in opposite directions, and if there is need for conversation, a third person acts as go-between. The same system applies to a daughter-in-law and her father-in-law.

Mr. Petrullo was accepted by the Yaruros as a relative of the gods, because of his sympathetic understanding of native ways and religion. The Yaruros did all in their power to aid the young scientist to gather facts about their manner of living.

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PALEONTOLOGY

Giant Sloths of Nevada Browsed on Yucca Plants

WHEN giant sloths inhabited Gypsum Cave in Arizona, famous for the discovery there a few years ago of human artifacts associated with the bones of extinct animals, the climate of the region probably was much moister than it is now. This is indicated by a study of the plant fragments in the digestive waste of the animals, which was abundant in the caves. A report of this study was presented before the meeting of the Geological Society of America at Berkeley, Calif., by J. C. Laudermilk of Clarement, Calif., and Dr. Philip A. Munz of Pomona College.

Eighty per cent. of the refuse, the two scientists stated, consisted of tissues of a species of giant yucca known as the Joshua tree. The remainder was derived from various other desert plants. This yucca species does not grow in the vicinity of Gypsum Cave today, but is abundant in the Clark Mountains, 42 miles distant and at about 3,500 feet greater elevation, with a more generous rainfall.

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Courtesy of Newark Museum

SILK—OLD AND NEW

The young lady on the right is dressed in a real silk dress of a generation ago while her companion on the left wears a dress of modern synthetic materials. They are photographed at the Newark Museum's Miracles of Chemistry exhibit with a chemist who is explaining the process of producing synthetic textile materials.

GENETICS

Chance Big Pears Have Double Chromosome Count

GIANT PEARS, borne as "sports" on big-leaved, big-flowered branches developing on otherwise normal trees, owe their greater size to a doubling of the number of chromosomes, the heredity-carrying structures within the nuclei of their cells. The occurrence of these freak fruits and their explanation were the subject of a report from the department of genetics, Carnegie Institution of Washington, Cold Spring Harbor, N. Y., presented before the meeting of the National Academy of Sciences by Drs. J. L. Cartledge, A. D. Shamel and A. F. Blakeslee.

Dr. Shamel first observed the giant fruits in California and wrote them up in a scientific journal. His associates saw the report, remembered that similar giantism in specimens of jimsonweed was associated with double chromosome count, and obtained specimens of the pear pollen. The pollen grains told the tale; they were double-sized, too, indicating that they contained the double chromosome number.

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GENETICS

X-Raying Male Cells Causes Increase in Male Offspring

Experiments With Fruit Fly Cells Also Adds to Knowledge of the Inheritance of Disease

X-RAYS cause more male children to be born—in the case of the little flies that are seen buzzing around bananas.

Dr. John W. Gowen of the Rockefeller Institute for Medical Research's laboratory at Princeton, N. J., reported to the American Philosophical Society an increase in the proportion of males to females as a result of X-ray treatment of the male reproductive cells of the fruit fly, *Drosophila.*

Whether the same results could be obtained with other species, such as man, was not reported. Dr. Gowen, however, was not conducting his observations in the interests of the militarists, nor even with a view to increasing the male population among fruit flies. He was investigating the problem of congenital disease.

Why are some children born defective? What part does constitution play in a person's resistance or susceptibility to disease? What factors are responsible for long life in one individual while another dies at a relatively early age? These are some of the problems on which Dr. Gowen's investigations with the fruit flies are shedding light.

"During development the body, due to its inheritance, may become a mosaic of cells, some normal, some abnormal, and the morbidity and mortality may increase directly with the proportion of defective cells in the mosaic," Dr. Gowen explained.

Four Ways

This is one of four general ways in which the genetic or inherited constitution of an organism may affect the development of a diseased condition. The other three are as follows:

An unbalance in the proportion of genes, or hereditary units, may cause death or greatly reduce the length of life.

Genes normal to a species may by a permanent change in character cause physiological and developmental processes so abnormal that death or lasting disability results.

The segregation of specific genes for susceptibility or resistance to diseases caused by bacteria or viruses may be responsible for immunity, disease or death within the population exposed to disease-causing bacteria.

Starting with these known facts, Dr. Gowen sought information on the total genetic constitution of a single organism. X-ray analysis seemed to him a method for such an investigation. Consequently he exposed *Drosophila* sperm cells to graded doses of X-ray and found four types of change.

Besides the increase in the proportion of males to females, he observed that a large number of the sperm cells die in a prescribed order; that many sex-linked fatal changes are produced; and that a few changes in the character of the genes occur which cause changes in body form.

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PALEONTOLOGY

Archancestral Crocodile Modeled for Museum

See Front Cover

KIPLING, in one of his happiest tales, long ago gave us an authentic and authoritative account of how the nose of the Elephant's Child got that way, from poking it too much into other animals' affairs—specifically into the affair that is the crocodile's snout. It has, however, remained for a Yankee scientist, Barnum Brown of the American Museum of Natural History, to dig up the bones of the Crocodile's Ancestor, and by a technique that combines the knowledge of the anatomist and the skill of the sculptor, to re-clothe them with the similitude of flesh and make this strange beast live again before our eyes.

This great-grandpa of all the 'gators lived some two hundred million years ago in a tropical swamp that has since cooled off and dried up and is now part of the Painted Desert of Arizona. Its fossilized bones, which were recovered

with practically no parts missing, show it to have been much smaller than modern 'gators and crocs—only 32 inches long. Its snout was rather shorter in proportion than a modern alligator's, much shorter than a modern crocodile's. It stood up on its legs in a little more lizard-like fashion, and it did not wear nearly so elaborate a suit of armor as any of its modern descendants.

And it had never heard of the Elephant's Child. There weren't any elephants then.

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EVOLUTION

Man's Use of His Hands Depends on His Legs

MAN OWES his tool-adapted arms and hands partly to his legs. His tree-dwelling ancestors probably had arms proportionately much longer, as tree-dwelling animals today mostly have. But when he dropped out of his arboreal home and began to walk about on the ground, his legs lengthened a good deal and his arms shortened somewhat, until they were of the present advantageous length for using tools and handling things.

This idea was put forth by Dr. Charles B. Davenport of the Carnegie Institution of Washington's Department of Genetics, located at Cold Spring Harbor, N. Y., in an address before the meeting of the National Academy of Sciences.

It is also a great advantage to man that his first ground-dwelling ancestors chose to walk instead of hopping like a kangaroo, even though the latter method of locomotion gets one about much faster. For leaping animals of that type have very much reduced arms, which would be of very much less use as tool-handlers.

Shadowed in Embryo

The ancestral history of man's limbs has its reminiscent shadow in the way they grow, before birth and during infancy. At first, the arms grow a little more rapidly than the legs, but some time before birth the legs overtake and pass the arms. At birth, the upper arm and forearm of a baby are about equal in length, but in later life the upper arm becomes the longer. Similarly, the thigh is at first no longer than the lower leg, but later on considerably surpasses it.

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EVOLUTION

Evolution Now "Experimental Fact"; Species Made to Order

"ORGANIC evolution is no longer an hypothesis. It is an experimental fact; new species have been built while we look on, and in some cases we know how they have been built."

With this challenging dictum, Prof. Edwin G. Conklin of Princeton University concluded the Penrose Memorial Lecture before the meeting of the American Philosophical Society, oldest of American science organizations, founded in 1727 by Benjamin Franklin.

Prof. Conklin's subject was "A Generation's Progress in the Study of Evolution." More progress has been made in the solution of evolution's riddles during the past quarter century than in all previous centuries, he declared.

The most fruitful field for the study of evolution, the speaker stated, has been found in the very heart of the cells. He said:

"Imagine the amazement and incredulity of the naturalists of a former generation who thought of evolution as the transformations of developed organisms under the influence of changing environment, if they could learn that today the great problems of evolution center in the structures and functions of the germ cells! And yet this is strictly and literally true. The germ cells are the only living bonds not only between generations but also between species, and they contain the physical basis not only of heredity but also of evolution.

"In the microscopic chromosomes which are found in the nuclei of all cells, and in the ultra-microscopic inheritance units, or genes, which lie in the chromsomes are found the causes of heredity, mutation, and evolution."

By the manipulation of mutations, or sudden large changes, it has been possible to create actual new species, Dr. Conklin indicated.

"The most important advances of the past twenty years concern the causes of mutations, or inherited variations, which are the building materials of evolution," he said. "Among these causes are changes in the numbers and composition of the chromosomes of the germ cells and changes in the inheritance units or genes which lie in those chromosomes.

"In many plants it has been found that new mutations are caused by an increase or decrease of their chromosomes and in a few instances absolutely new species have been formed which breed true but are sterile with their parent stocks."

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PHYSIOLOGY

Acetyl-Choline May Prevent Benzene Deaths

THE MANY cases of sudden death due to benzene poisoning that occur each year in various industries where benezene is commonly used as a solvent

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may be prevented by an injection of the drug, acetyl-choline. This announcement was made before the New Haven Medical Society by Dr. Louis H. Nahum, of the Yale Medical School, who told of his work in this field with Dr. H. E. Hoff, also of Yale.

Benzol vapor, Dr. Nahum explained, produces an abnormal sensitivity of the heart to adrenalin, a common constituent of the blood, bringing about an irregularity in the heart beat which causes death. Adrenalin, incidentally, is sometimes injected into a heart that has stopped beating, in an effort to restore life. Excitement and physical activity predispose to the occurrence of sudden death by benzol vapor, the Yale scientists found. Excitement, moreover, is a condition in which the adrenal glands pour into the blood large amounts of adrenalin. Animals deprived of adrenalin did not die of ventricular-fibrillation, the fatal irregularity of heart action which appears to be the cause of death in benzene poisoning.

"We found, further, that an injection of acetyl-choline counteracted the action of the adrenalin and protected the animals against this fatal irregularity," Dr. Nahum said.

This finding, while important in itself, opens up a new field of investigation of the causes for death by heart failure. Adrenalin under abnormal conditions, one of them being exposure to benzol vapors, produces ventricular-fibrillation.

Whether other conditions, heretofore overlooked by physicians, predispose the heart to the lethal action of the adrenalin remains to be investigated.

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ASTRONOMY—PHYSICS

Corona May Be Seen Without Eclipses By Means of Television

ASTRONOMERS will not need to chase eclipses around the world for a fleeting few minutes in which to observe the sun's corona if a new method of observing the corona suggested to the National Academy of Sciences by A. M. Skellett of the Bell Telephone Laboratories proves practical.

Television apparatus promises to solve the problem of viewing the corona at any time that the sky is clear. Mr. Skellett's scheme is to scan the image of the sky around the sun's disk with an "electric eye" photoelectric cell in much the same way that a television image is obtained. The glare around the sun is caused by scattering of light and it prevents the seeing of the corona because it is many times brighter. This glare will produce, Mr. Skellett finds, a kind of photoelectric current in the television apparatus different from that of the light of the corona. It will be possible to sort out with electrical filters the high frequency components of the photoelectric current caused by the corona and then feed them into a television receiver which will reproduce the main features of the corona.

The method proposed has not yet been used upon the sun but Mr. Skellett has tested with success the essential features using television apparatus and bright lights in his laboratory.

The corona was photographed through the uneclipsed sun's glare by use of special photographic methods developed in Europe two years ago, but Mr. Skellett's method promises better results.

Mr. Skellett hinted that other uses for the television method of discriminating between conflicting lights of different sort are planned.

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MEDICINE

Football Bladder Keeps Man Breathing

A FOOTBALL bladder strapped to his chest has kept an almost completely paralyzed patient, S. Crosby Halahan, breathing continuously for the past six months, it appears from a report by Dr. Phyllis Tookey Kerridge of the London School of Hygiene to *The Lancet*. Dr. Kerridge has just designed a new apparatus to replace the football bladder.

Mr. Halahan is a man now 63 years old. He is suffering from a progressive wasting of the muscles which started in 1927. Although almost completely paralyzed he is still mentally alert and contented. By 1931 he began to have difficulty in breathing as a result of the gradual paralysis of his muscles.

From June, 1932, until September, 1933, he was kept alive by manual artificial respiration maintained continuously by relays of relatives and nurses. Then his friend, Sir William Bragg, Fellow of the Royal Society, designed a hand-operated machine for inflating a football bladder bandaged to Mr. Halahan's chest. In October, 1933, he designed hydraulic bellows for inflating the football bladder, which have worked successfully ever since, except once when the water froze.

An old injury to the right side of Mr. Halahan's chest has made it extremely sensitive to pressure, so Dr. Kerridge designed a rubber bag which surrounds the left side of his chest only and is now successfully taking the place of the football bladder apparatus.

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ARCHAEOLOGY

Assyrians Threw Dice To Choose High Official

ONE OF THE DICE used by Assyrians 3,000 years ago in choosing an official for a great national honor has been discovered in the Babylonian Collection of Yale University, Prof. Ferris J. Stephens, acting curator, announced.

The die is a cube of baked clay a little over an inch across. It is labeled the "lot of Iahai." Historians recognize Iahai as a high official of Shalmaneser III, King of Assyria in the ninth century B.C. Iahai was one of the dignitaries whose name was put into the hat, so to speak, in choosing the "eponym official" for one year. The lucky man would have lasting fame, because the next year would be officially known by his name.

The name of a missing king of Babylonia has been restored to royal history through discovery of a brick from walls of a temple in Nippur. The brick, acquired by the Babylonian Collection of Yale recently, reveals the impressive sounding name of Hashmargalshu, who lived about 1550 B.C. Although he tried to take care of his historic immortality by setting up a memorial tablet in the temple of a god, this King Hashmargalshu had the perverse bad fortune of being the only king out of 36 in his dynasty to be forgotten—until now.

A story of rivalry between two queens has also come to light through deciphering of writing on a stone pillar. The inscription tells of a queen Shalabashtashu who calls herself the "beloved wife of Rim-Sin," Prof. Stephens said.

"We knew already the name of another wife of this king," he said, "who also called herself 'the beloved wife of Rim-Sin,' and who dedicated a memorial in honor of her husband.

"Apparently this new inscription shows that Shalabashtashu was trying to outdo the other wife, for she says that the structure which she has caused to be erected is something 'which up to that time no woman had ever done.'"

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▼ RADIO ▲

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an address by

Prof. Samuel G. Barton

Of the Department of Astronomy, University of Pennsylvania

Wednesday, May 2, at 3:40 p. m., Eastern Standard Time, over Stations of the Columbia Broadcasting System. Each week a prominent scientist speaks over the Columbia System under the auspices of Science Service.

ARCHAEOLOGY

Architects Discover Danger at Temple

THE LITTLE temple of Nike, or Victory, one of the architectural gems on the Acropolis, is in danger of caving in. Architects, investigating the foundations, reported the weakness of the structure.

As a result of the report, arrangements are now being made to take down the temple and re-build the base on which it stands. The temple will then be set up again on the new, firm foundation. The project is expected to require a year. Temporary removal of the building is welcomed by archaeologists, who see a chance to learn whether a still more ancient structure stood on the site of the Temple of Victory.

Athenians came to this temple to worship Athena as Goddess of Victory. After the Athenians defeated the Persians, it was said, they desired to bind Victory to themselves, and so they cut off her wings to make flight impossible. The Greek writer Pausanias called the temple that of Wingless Victory.

The Nike temple was built about 410 B.C. and stood until 1687, when it was damaged in the bombardment of Athens by the Venetians. The Turks at that time took the temple materials to use in building a bastion. About a century ago, German and Greek architects attempted to restore the temple to its original delicate beauty, but lack of experience in this type of problem resulted in a reconstruction lacking in permanence. Violent storms or even slight earthquakes threaten the edifice.

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ICHTHYOLOGY

NATURE RAMBLINGS by Frank Thone

The Big, Bad Barracuda

WHEN President Roosevelt wisecracked about coming back from his vacation a "tough guy," having "learned all kinds of lessons from barracuda and sharks," he singled out about the most appropriate pair of submarine professors that could have been selected by one whose job it is to battle the big fish in the rough waters of our present economic turmoil. Anybody who can get the better of those spike-toothed "hard babies" off the Florida keys need not hesitate to challenge their human counterparts in Wall Street or the Wheat Pit.

The shark's reputation is already thoroughly and widely established. He is popularly looked upon as the epitome of all that is insatiably voracious, cruelly cold-blooded, utterly indifferent to the rights of anything else in the sea—even other sharks. He is rugged individualism to the ruthless limit.

But the barracuda surpasses even the shark. His voraciousness, his cruelty, his rapacity are at least equal to the shark's, and he adds to these two qualities that make him even more formidable. He is of a higher evolutionary status than the shark, and is therefore more intelligent; and he is much readier to attack.

His truculence is perhaps the most outstanding thing about him. A shark will seldom attack a man under water, but a barracuda is apt to rip at him entirely unprovoked. Dr. Paul Bartsch, Smithsonian marine biologist, who often puts on a diving helmet and walks about on the sea bottom to get better acquainted with things down there and to take photographs, states that he has always found the shark a gentleman, but confesses to nervousness whenever a barracuda is about.

The barracuda is a big fish, though nowhere nearly the size of a man-eating shark. The latter ranges from twen-

ty feet up, while the biggest barracuda is seldom more than a six-footer. In general appearance the barracuda resembles the muskallunge of freshwater lakes in the North, and his pike-like manners correspond well to his greater size. Curiously enough, though, the barracuda is not very closely related to the fierce freshwater cousins, muskallunge and pike, but has as his next of kin the rather good-natured, mild-mannered mullets, which also abound off the coast of Florida.

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SEISMOLOGY

Earthquakes of the Week

NORTHERN VERMONT experienced a local earthquake of 20 seconds duration Saturday night, April 14, 9:58 p. m., E.S.T. Prof. E. C. Jacobs, University of Vermont seismologist, rated it as a feeble shock of intensity four on the Rossi-Forrel scale. It was too near to develop characteristic waves on the seismographic record.

The strong earthquake that was recorded on the seismographs of the world on Sunday the 15th was centered near the island of Mindanao in the Philippine Islands, the U. S. Coast and Geodetic Survey has determined, using seismological reports telegraphed to Science Service. Strong shocks have occurred in this area before. The longitude and latitude of the approximate epicenter was 8 degrees North and 127 degrees East. The time of origin was 5:15½ p. m. E.S.T.

Seismologic stations reporting the Philippine quake were: Meteorological Observatory, Victoria, B. C.; Georgetown University, Washington, D. C.; Fordham University, New York City; U. S. Coast and Geodetic Survey stations at Honolulu, Tucson, Ariz., and Chicago.

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PSYCHOLOGY

Loud Sounds Seem Lower In Pitch Than Softer Tones

THE INTENSITY of a sound and its frequency are quite distinct physical attributes, but the corresponding psychological attributes of loudness and pitch are not so independent; a loud tone sounds lower in pitch than a high one, and a low tone sounds unduly loud, it was indicated by a report to the National Academy of Sciences delivered at the annual meeting by Dr. Harvey Fletcher, of the Bell Telephone Laboratories, New York City.

A group of ordinary listeners who took part in the reported experiment found that a 50-cycle tone with an intensity which is 10,000 times that of a just barely audible sound appears just as loud as a 1,000 cycle tone with an intensity 1,000,000,000 times that of the threshold.

The apparent pitch of a tone also depends upon its intensity, it was found. The pitch of a 200-cycle tone was heard as being as much as a quarter of an octave lower at the very high intensities than at the low intensities. However, when the tones were of very high frequencies, near 2,000 or 3,000 cycles, such changes of apparent pitch with intensity were not observed.

When ten tones are sounded together, is the resulting sound ten times as loud as each one alone? Speaking from the point of view of physics, the answer is yes. But speaking from the point of view of psychology, it all depends upon the pitch of the component tones. The loudness of one such complex tone with frequencies which are harmonics of 500 cycles per second was found to be one thousand times louder than one of the components instead of only ten times.

Science News Letter, April 28, 1934

•First Glances at New Books

Additional Reviews On Page 271

Mining—Economics

THE ECONOMICS OF MINING—Theodore Jesse Hoover—*Stanford Univ. Press,* 547 p., $6. Mining is not a mere matter of geology and metallurgy. It involves dollars and cents as well. This book by Stanford University's engineering dean deals with valuation, organization and management of non-ferrous mines. Addressed primarily to young mining engineers, the book seeks to answer: How may the metal mining industry get the most for its money in the long run?

Science News Letter, April 28, 1934

Biology

ADAPTATION ECOLOGIE ET BIOCOENOTIQUE—Marcel Prenant—*Hermann et Cie.* (*Paris*), 60 p., 15 fr.

Science News Letter, April 28, 1934

Geology

METAMORPHISM—Alfred Harker—*Dutton,* 360 p., $5.90. Dr. Harker approaches metamorphism from the dynamic point of view; he considers the process first, the products afterwards. His treatment of the process is two-fold: first thermal, then regional metamorphism. This book will be highly valuable to more advanced students in geology, who will also find the very numerous diagrams, drawn from microscope studies, of great assistance in rendering unmistakable the clear descriptions in the text.

Science News Letter, April 28, 1934

Biology

DYSHARMONIES ET DISCONTINUITES DANS LA CROISSANCE—Georges Tessier—*Hermann et Cie.* (*Paris*), 39 p., 10 fr.

Science News Letter, April 28, 1934

Biology

LES PAGURES OU BERNARDS L'ERMITE (UN EXEMPLE D'ADAPTATION)—Charles Pérez—*Hermann et Cie.* (*Paris*), 33 p., 9 fr.

Science News Letter, April 28, 1934

Biology

POLARISATION ET DEPOLARISATION CELLULAIRES — M. Dubuisson — *Hermann et Cie.* (*Paris*), 47 p., 12 fr.

Science News Letter, April 28, 1934

Biology

REPRODUCTION SEXUALITE HEREDITE—Georges Bohn—*Hermann et Cie.* (*Paris*), 89 p., 15 fr.

Science News Letter, April 28, 1934

First Glances at New Books

Additional Reviews On Page 270

Geography

GEOGRAPHY IN RELATION TO THE SOCIAL SCIENCES—Isaiah Bowman—*Scribner's*, xxii+240 p., $2.25. With the planners of the New Deal giving much thought to the matter of adjusting the American population to the land that must support them, Dr. Bowman's book is most timely—the more so since he himself, through his positions as director of President Roosevelt's Science Advisory Board and as chairman of the National Research Council, can in the ordinary course of events be expected to have considerable influence in making at least the beginnings of that adjustment. The book is a thoughtful and scholarly piece of work, both in its grasp of the great necessary methods and generalities of applied geography and of such specific human details as geography and conservation, and geography in relation to city and regional planning.

Science News Letter, April 28, 1934

Radio

THE RADIO AMATEUR'S HANDBOOK—*American Radio Relay League*, 238 p., $1. The eleventh edition of the "bible" of the radio "ham." It is a source of inspiration and information to thousands who practice amateur radio as a hobby.

Science News Letter, April 28, 1934

Sociology—Economics

THE ABC OF THE NRA—Charles L. Dearing, Paul T. Homan, Lewis L. Lorwin and Leverett S. Lyon—*Brookings Institution*, 185 p., $1.50. The background and content of the Recovery Act and a picture of the activities of the Recovery Administration are presented by skilled economists.

Science News Letter, April 28, 1934

Biology

THE CLASSIFICATION OF THE FREE-LIVING NEMATODES AND THEIR RELATION TO THE PARASITIC NEMATODES—I. N. Filipjev—*Smithsonian Institution*, 63 p., 8 pl., 25c.

Science News Letter, April 28, 1934

Language

A GERMAN READER FOR BIOLOGY STUDENTS—H. G. Fiedler and G. R. de Beer—*Oxford*, 92 p., $1.50. No matter how difficult the hopeful student of biology may find his assault on German, there is no blinking the fact that without a decently fluent reading knowledge of that language he will be under a lifelong handicap; hence the need for well-planned and diligently-pursued courses in scientific German for those who cannot spare the time to obtain a really full preparation. For such courses a better reader than the present brief book could hardly be found: it is made up of extracts from significant writings by leading modern German biologists; and the vocabulary, by Herma E. Fiedler, is in itself almost a dictionary of German biological terms.

Science News Letter, April 28, 1934

Chemistry

TABLE INTERNATIONALE DES POIDS ATOMIQUES—*Union Internationale de Chimie, Paris*, 62 p. The fourth report of the Commission on Atomic Weights, given in English, German and French. The English version is also printed in the Journal of the American Chemical Society for April, 1934.

Science News Letter, April 28, 1934

Mathematics

LA FLUORESCENCE DES MOLECULES DIATOMIQUES—P. Swings—*Hermann et Cie, Paris*, 29 p., 12 fr.

Science News Letter, April 28, 1934

History—Museum Science

HISTORIC HOUSE MUSEUMS—Laurence Vail Coleman—*American Assn. of Museums*, 187 p., 66 illus., $2.50 (members, $2). Americans are coming to take an affectionate and intelligent pride in distinguished old houses of various periods of our history. The idea of saving such houses can be traced to 1850 when New York State acquired Washington's headquarters at Newburg. Today more than 400 houses have been salvaged and restored to their old-time personalities. A large part of Mr. Coleman's book is a manual of useful information for those who administer such museums. But those who are attracted to historic houses as students or tourists may find much of interest in the chapter on the history of American dwellings, and the numerous photographs, and perhaps also in some of the problems of museum-making. A directory of historic house museums is included.

Science News Letter, April 28, 1934

Ethnology-Literature

GILGAMESH—William Ellery Leonard—*Viking Press*, 80 p., $2. While far less familiar to the reading public than the Greek Odyssey, Babylonia's epic of a great adventurous king deserves modern fame. Perhaps wider fame will come with this English translation in free verse splendidly done by a poet-professor. Prof. Leonard has followed, with a few deviations, the German version of Dr. Hermann Ranke. A fortunate circumstance brought Dr. Ranke to the University of Wisconsin as a visiting professor in 1932, and enabled Prof. Leonard to collaborate with him personally in the English translation of the world's "oldest great poem."

Science News Letter, April 28, 1934

Medicine

THE REVIEW OF GASTROENTEROLOGY—*Society for the Advancement of Gastroenterology*, $2 per annum, foreign, $3. This new scientific publication, of which the first number has just appeared, will be devoted to that branch of medicine which deals with diseases and disorders of the digestive tract. It is the official organ of the society publishing it and has an impressive list of collaborating editors.

Science News Letter, April 28, 1934

Physics

SOUND—E. Laurence Palmer—*New York State College of Agriculture, Cornell University*, 31 p., 10c. This leaflet was quoted in the SCIENCE NEWS LETTER of March 31 at 20c. The leaflets appear quarterly, the September, or teachers' number, being the only issue priced at 20c.

Science News Letter, April 28, 1934

Mental Hygiene

HYGIENE OF THE MIND—Ernst von Feuchtersleben, Tr. by F. C. Sumner—*Macmillan*, 150 p., $1.25. We think of mental hygiene as beginning with the movement originated in recent years by Clifford H. Beers. This small volume contains the writings of a physician who was also a poet, published originally in Austria in 1838.

Science News Letter, April 28, 1934

Science News Letter will secure for its subscribers any book or magazine in print which was published in the United States. Send check or money order to cover regular retail price ($5 if price is unknown, change to be remitted) and we will pay postage in the U. S. When publications are free, send 10c for handling. Address Book Dept., Science News Letter, 21st and Constitution Ave., Washington, D. C.

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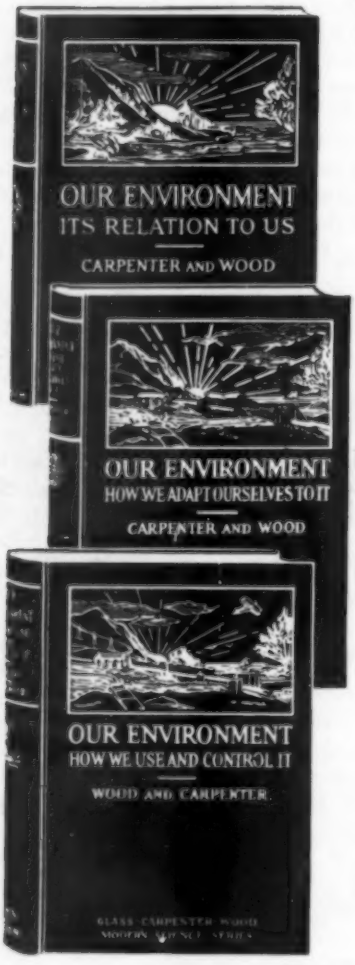

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